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Supporting Online L2 Academic Reading Comprehension with Computer-mediated Synchronous Discussion and Elaborative Feedback

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ABSTRACT

This mixed-methods study investigated the use of both post-reading computer-mediated synchronous discussions and elaborative feedback incorporated within online reading texts as supports for second language readers in academic contexts. The participants were 202 students studying at a higher education institution in the United Arab Emirates. The data collection instruments consisted of pre-and post-test measures of online reading comprehension, a post-reading online synchronous text discussion, and an online questionnaire. The results of the quasi-experiment showed a significant, positive effect on reading comprehension for post-reading, computer-mediated synchronous discussions. Furthermore, an analysis of discussion logs and questionnaire responses supported the use of both post-reading synchronous discussions and elaborative feedback for enhancing online L2 reading comprehension.

INTRODUCTION

The number of readers who regularly access texts online in a second language (L2) has grown exponentially over the past 20 years due to the ever-increasing availability of internet connections worldwide (Liaw, 2017). Indeed, Bernhardt (2011) suggests that L2 reading may now be the dominant global literacy. While the availability of online texts has undoubtedly led to greater opportunities for L2 readers to engage in reading authentic texts, it has also created challenges for those who do so as part of their academic work or studies due to the different comprehension strategies required when reading online (Park, Yang, & Hsieh, 2014). Furthermore, although some reading takes place in classrooms, where support from an instructor or peers may be available to assist with reading text comprehension, for many students a large amount of L2 reading occurs in locations where they are physically isolated from others (Murphy, 2010). Given the importance attributed to interaction with others for both second language acquisition (SLA) and learning across other subject areas (Gibbons, 2015; Lantolf & Thorne, 2006; Long, 1996), the potential of computer-mediated communication to bridge this physical divide and provide L2 readers with support in comprehending online texts is worthy of further attention.

Previous research has investigated whether support, such as elaborative feedback providing hints and additional explanations (Murphy, 2007, 2010), can be effectively incorporated into online texts to enhance L2 reading comprehension. However, the findings have been inconclusive. Numerous studies have suggested that Computer-mediated Synchronous Discussion (CMSD) is beneficial for SLA (Lin, Huang & Liou, 2013; Sauro, 2011). However, little research has been undertaken into the use of CMSD to improve L2 reading comprehension. This paper reports on an investigation into whether collaborating with peers in a post-reading CMSD activity can enhance the online reading comprehension of L2 readers of English in a higher education context. In addition, it examines whether elaborative feedback, when used in combination with CMSD, is an effective support to online L2 reading comprehension.

LITERATURE REVIEW

L2 Reading

Reading has been described as an interactive process, involving both the interaction between the reader and the text, and that between top-down processes, such as the use of background knowledge, and bottom-up processes, such as word recognition (Grabe, 2009; Grabe & Stoller, 2011; Hudson, 2007). According to this view of reading, a skilled reader interacts with a reading text by seeking both main ideas and relevant supporting information whilst using an array of reading strategies and prior knowledge to construct meaning (Singhal, 2011). While a number of interactive models of first language (L1) reading have been developed (Grabe & Stoller, 2011; Hudson, 2007), these do not account for the important differences that exist between L1 and L2 reading, such as the fact that at least two languages are involved in the latter. Such models are therefore limited in their ability to describe L2 reading.

The Compensatory Model of Second Language Reading

However, Bernhardt (1991, 2005, 2011) offers a model of L2 reading which was influenced by these L1 models. Her *Compensatory Model of Second Language Reading,* which attempts to explain and predict findings from L2 reading research, identifies three main components of L2 reading, namely *L1 literacy*, *L2 language knowledge*, and *other*. These three components, in combination with the notion of *compensatory processing*, are used to explain and predict L2 reading. *L1 literacy* refers to factors such as alphabetic knowledge, L1 vocabulary, and knowledge of L1 text structure. *L2 language knowledge* includes knowledge of L2 grammar and vocabulary, the existence of cognates, and the linguistic distance between L1 and L2. In Bernhardt's model, *L1 literacy* and *L2 language knowledge* are theorized to account for up to 20% and 30% of L2 reading respectively. The remaining 50% is accounted for by the third component, *other*, which includes factors such as comprehension strategies, motivation, engagement, and content and domain knowledge. The *Compensatory Model* posits that an L2 reader relies on the simultaneous use of these multiple knowledge sources, according to need, whenever a reading difficulty is encountered. Furthermore, through *compensatory* processing, deficits in one knowledge source, such as L2 vocabulary knowledge within the *L2 language knowledge* component, can be compensated for by greater reliance on another source, such as background knowledge, which is located within *other*.

A Socio-cognitive View of L2 Reading

The view of reading taken in this paper is a socio-cognitive one, informed by both the *Compensatory Model* (Bernhardt, 2011) described above, and sociocultural theory. In this view, interactions between reader and text and between the various top-down and bottom-up processes, in addition to interactions between readers in a sociocultural context, are all considered important. Some researchers have argued that a purely cognitive or psycholinguistic focus on the reader and the text alone is too narrow (Commander & Guerrero, 2013; Ghafar Samar & Dehqan, 2013; Yang & Wilson, 2006). For example, Commander and Guerrero (2013) present a sociocultural perspective of reading, which stresses the importance of interactions between readers and emphasizes the socially-mediated nature of meaning construction. While acknowledging the importance of interactions between reader and text and between top-down and bottom-up processes, they argue for views of reading to be extended in order to consider ways in which meaning is co-constructed when two or more readers work together in a collaborative manner to comprehend a text. The next section will look briefly at interactions between L2 readers and electronic texts. This will be followed by a consideration of interactions between L2 readers either at or via computers.

L2 Reading and Electronic Texts

Reading from an electronic screen is different from reading from paper in a variety of ways. For example, navigation strategies, such as scrolling and clicking, are important features of online reading that are not relevant to printed text (Konishi, 2003). As Park et al. (2014) note, online reading requires comprehension skills and strategies that "go beyond what traditional reading comprehension strategies can inform" (p. 148).

Elaborative Feedback

Alongside the challenges presented by digital texts, mechanisms to support online L2 reading comprehension have also been investigated. One feature of computer-based activities that can provide immediate support to learners and potentially enhance online L2 reading comprehension is feedback (Murphy, 2007, 2010). While feedback may come directly from teachers or peers during human-to-human interactions, certain types of feedback may be embedded within online exercises. Clariana (2000) identifies three types of feedback: *knowledge of response* feedback indicates whether a response is correct or incorrect; *knowledge of correct response feedback* states the correct response; and *elaborative feedback* provides more complex support that provides additional explanations, hints, or directions to lead a learner towards a correct response. Investigations into the most effective types of feedback for language learning have proven inconclusive (Brandl, 1995; Murphy, 2007, 2010; Nagata, 1993, 1996), with individual differences among learners, such as level of linguistic proficiency and metacognitive awareness, affecting both the use and the usefulness of feedback. With regard to L2 reading, Murphy (2007) found that elaborative feedback was not significantly more effective than knowledge of response feedback in enhancing comprehension. However, in a follow-up study, Murphy (2010) observed that elaborative feedback could enhance L2 reading comprehension

when used in conjunction with CMSD activities. The issues related to CMSD will be addressed below.

Interactionist and Sociocultural Perspectives

A variety of perspectives, both of general learning and of SLA, consider interaction with others as a vital part of the learning process. For example, interactionist accounts of SLA highlight the role of negotiation for meaning during communication breakdowns in promoting SLA (Gass & Selinker, 2008). In a related manner, Sociocultural Theory (SCT) emphasizes the socially-mediated nature of learning and knowledge creation (Lantolf & Thorne, 2006; Mitchell, Myles, & Marsden, 2013). Central to sociocultural perspectives of second language learning are the Zone of Proximal Development (ZPD) and scaffolding (Mitchell et al., 2013). The ZPD is defined as:

> the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1978, p. 86)

Scaffolding

The guidance or support provided by a teacher, adult, or more knowledgeable peer is known as scaffolding (Gibbons, 2015). Gibbons argues that learning takes place most effectively when a task is within the ZPD of a learner and when sufficient scaffolding, in the form of tailored, targeted assistance, is provided by a more knowledgeable other. She asserts that if a task is too easy, learners will become bored, whereas if it is too difficult and inadequate support is provided, they will become frustrated and little or no learning will occur.

As seen above, sociocultural approaches to L2 reading emphasize the co-construction of meaning when two or more readers work collaboratively while reading a text. For learners studying in situations where they have no face-to-face access to peers or instructors for all or part of their study time, CMSD offers the opportunity to interact with others in a manner that was impossible prior to the development of the internet (Murphy, 2010).

Text-based CMSD

While modern computers and mobile devices offer the possibility of both synchronous and asynchronous communication incorporating audio, video, text and graphics, this paper will focus on 'synchronous written chat' (Lin, Huang & Liou, 2013). This form of CMSD has been shown to provide large amounts of meaning-focused reading practice (Kelm, 1992) and to encourage negotiation for meaning (Blake, 2000), while at the same time lowering learner anxiety levels (Satar & Ozdener, 2008). Lin et al. (2013) performed a meta-analysis of 10 studies that investigated the use of CMSD to enhance SLA. They found a small but significant positive effect for CMSD when compared with face-to-face, voice chat, and asynchronous computer-

mediated discussions. However, like Li (2013), they found that both learner and task variables could affect the usefulness of CMSD tasks.

Sauro (2011) presented a synthesis of research into synchronous computer-mediated communication for SLA. She examined 97 studies and found that grammatical competence had received the most attention, having been a focus of approximately 50% of the articles, with strategic competence, sociocultural competence, and discourse competence also attracting significant attention. In comparison with the number of studies that have investigated the use of CMSD for promoting SLA, far fewer have looked at CMSD to enhance L2 reading comprehension. Fernández-Garcia and Arbelaiz (2002) investigated the use of post-reading CMSD activities with 28 students of L2 Spanish. Through a qualitative examination of discussion logs, they found that all but one of the CMSD sessions produced instances of negotiation for meaning, which were largely centred on lexical items rather than grammatical structures. The use of L1 was also noted when clarifications were being provided. Murphy (2010) investigated the use of CMSD with 425 Japanese university students learning L2 English. The participants took part in CMSD dyads while completing online reading comprehension exercises containing either knowledge of correct response feedback or elaborative feedback. Murphy found that elaborative feedback was significantly more effective at promoting reading comprehension when used in combination with CMSD than was knowledge of correct response feedback. Through a qualitative analysis of discussion logs, he also found that CMSD promoted negotiation for meaning and exploratory talk. The former is considered beneficial for language acquisition according to interactionist perspectives of SLA (Gass & Selinker, 2008; Long 1996), while the latter is viewed as a characteristic of effective collaborative learning by some researchers working within a sociocultural framework (Mercer, 2004; Wegerif, Mercer, & Dawes, 1998)

This current study differed from these previous studies cited above. Following Murphy (2010), the theoretical framework employed here draws on both sociocultural and interactionist perspectives of SLA, which are discussed above. However, here, a quasi-experimental design was used to investigate the effect of CMSD. This contrasts with both Fernández-Garcia and Arbelaiz (2002) and Murphy (2010). The former study used purely qualitative analysis, whereas in Murphy's study, all participants took part in CMSD discussions. Furthermore, unlike these two studies, here an online questionnaire was used to investigate learners' perceptions of the usefulness of both CMSD and elaborative feedback.

In light of the above review of the literature on L2 reading, elaborative feedback, and CMSD, the following research questions were investigated.

1. Can post-reading CMSD activities assist learners with L2 reading text comprehension?
2. Is elaborative feedback a useful support to post-reading CMSD in enhancing L2 reading comprehension?

METHOD

An embedded, mixed methods design was used for this study (Ivankova & Creswell, 2009; Riazi & Candlin, 2014). This involved the concurrent collection of quantitative and

qualitative data, in the form of pre- and post-test results, CMSD discussion logs, and online questionnaire responses.

Participants

The participants were 202 Emirati students studying for a Higher Diploma or Bachelor's Degree at the Higher Colleges of Technology in the UAE. They were in their second or fourth semester of study and were drawn from 10 pre-existing English language classes. All the participants were L2 speakers of English and were required to achieve a Band 5.5 in the Academic Module of the International English Language Testing System (IELTS) examination by the end of their fourth semester in order to continue their studies. All participants were competent computer users, having demonstrated basic computer-literacy skills as a condition of entry to their program of study.

The students were randomly assigned into either the treatment group (TG) or the control group (CG). Of the 202 students, 187 took the pre-test, while 15 were absent. For the post-test, 44 students were absent, with 158 completing the test. In total, 151 students completed both the pre-test and the post-test.

Instruments and Materials

Two online reading comprehension tests, one online reading comprehension exercise, an online questionnaire, and a post-reading CMSD activity were developed for delivery to the participants via *Blackboard*, the institution's chosen learning management system. This helped ensure that the participants were already comfortable with the technology involved. These instruments are described below.

Pre-test

The pre-test consisted of a 40-item, multiple-choice online reading comprehension test. This was adapted for online delivery from a published IELTS reading practice test (O'Sullivan & Lindeck, 2000). The test included three texts, with a combined length of 1,246 words and a time limit of 60 minutes, and was designed to measure pre-existing differences in reading comprehension between members of the treatment and control groups prior to the intervention.

Post-test

The post-test was adapted for online delivery from one section of a published IELTS reading practice test (Gould & Clutterbuck, 2005). The text was 463 words in length and was accompanied by seven multiple-choice and eight short-answer comprehension questions. This 20-minute test was designed to measure the reading comprehension of the treatment and control groups following the intervention.

Online Reading Comprehension Exercise

The online reading comprehension exercise contained 15 multiple-choice questions and was based on the same reading text that featured in the post-test. Furthermore, the 15 questions were written to test comprehension of the same parts of the reading text as the 15 items that were

included in the post-test. In addition to the questions, elaborative feedback was provided to offer additional support. Following an incorrect response, further guidance was provided to support the reader in finding the correct answer. This was achieved by indicating the part of the text containing the answer, along with scaffolding in the form of rephrasing or simplification. Following a correct response, the location of the relevant part of the text along with rephrasing to explain the answer was provided. The intention of the elaborative feedback, the design of which was inspired by the *Compensatory Model of Second Language Reading* (Bernhard, 2011), was to provide additional knowledge to assist with compensatory processing whenever readers encountered difficulties comprehending the text.

Online Questionnaire

The online questionnaire consisted of three Likert-scale and nine open-ended items and was designed to explore the participants' perceptions of the online reading comprehension exercise, the elaborative feedback contained within it, and the CMSD activity. These questions are listed below. Questions 1, 2, and 3 used a 5-point Likert-scale, ranging from 1 (strongly disagree) to 5 (strongly agree), and were written to collect quantitative data. Questions 1a to 3a and Questions 4 to 9 were written to collect qualitative data.

Q1. The online practice exercise helped me prepare for the test.

Q1a. Please explain your answer to Question 1

Q2. The feedback (help) in the practice exercise helped me understand the reading text.

Q2a. Please explain your answer to Question 2

Q3. The online chat session helped me understand the text.

Q3a. Please explain your answer to Question 3

Q4. What did you like about the reading practice exercises?

Q5. What would you like to change about the reading practice exercises?

Q6. What did you like about the feedback?

Q7. What would you like to change about the feedback?

Q8. What did you like about the online chat session?

Q9. What would you like to change about the online chat session?

Two versions of the questionnaire were created. One version, which contained all 12 items, was prepared for administration to the treatment group. A second version, which omitted the four items (Questions 3, 3a, 8, and 9) that focused on the CMSD activity, was created for delivery to the control group.

CMSD Activity

A 15-minute CMSD activity was designed to enable members of the treatment group to discuss the reading text and associated comprehension questions from the reading comprehension exercise described above. The task instructions asked the participants to discuss any difficulties that they had experienced in answering any of the comprehension questions or in

understanding any part of the reading text or the elaborative feedback. No further guidelines were provided to the participants. The discussions were hosted within chat rooms in *Blackboard* in order to generate discussion logs for qualitative analysis.

Procedures

During the first week of data collection, the researcher visited all 10 classes and administered the pre-test via *Blackboard*. This helped ensure consistency of test delivery. In addition, the regular classroom teacher was present in each class to assist with administrative issues and to help ensure that there was no collaboration between the participants, who were given 60 minutes to complete the test on personal computers.

In the second week, the researcher again visited all 10 classes in order to set up the delivery of the reading comprehension exercise, post-test, and online questionnaire with the support of the classroom teachers. The participants were randomly assigned to either the treatment group or control group using the random group feature in *Blackboard*. Members of the treatment group were asked to select a slip of paper with a room number on it, which corresponded to the chat room they should enter later to participate in the CMSD task. The participants were informed that they would first complete a reading comprehension exercise containing 15 questions and then complete a test, also containing 15 questions, based on the same text. Following this, the procedures for entering the chat room were demonstrated using a multimedia projector for the benefit of the treatment group.

Next, all participants were given 30 minutes to complete the reading practice exercise containing elaborative feedback. Following this, members of the treatment group were instructed to enter the appropriate chat room within *Blackboard* in order to discuss with their CMSD partner any difficulties they had encountered in answering any of the comprehension questions. Members of the control group were given an additional 15 minutes to work independently on the reading comprehension exercise. Once the comprehension exercise and CMSD discussions had been completed, all participants were asked to complete the post-test, following which they were invited to complete the online questionnaire.

Variables

With regard to Research Question 1, the independent variable was participation in a CMSD discussion, with two levels: ‘participation’ and ‘no participation’. The dependent variable was online reading comprehension, as measured by the post-test. The covariate was pre-existing online reading comprehension, as measured by the pre-test.

DATA ANALYSIS AND RESULTS

Quasi-experimental Results

In total, 187 results were obtained from the pre-test, with 96 participants from the treatment group (TG) and 91 from the control group (CG) completing the test. A total of 158 participants completed the post-test, 81 from TG and 77 from CG. Of these, 151 had also completed the pre-test, 77 from TG and 74 from CG. However, further analysis of the post-test data and the CMSD logs showed that 10 of the participants from TG had completed the post-test but had not participated in a CMSD discussion, while a further nine participants had entered a chat room but had participated in an off-topic discussion that had not addressed comprehension of the reading text or questions (see the example in Extract 4 below). In addition, three members of CG had entered a chat room, despite having been advised not to, but had not actively participated in a discussion. The scores of these 22 participants were therefore removed from the analysis. As a result, the pre- and post-test scores of 58 members of TG and 71 members of CG were analysed. The descriptive statistics for the pre-test and the post-test are presented below in Table 1.

Table 1. Results of the Pre-test and Post-test by Group

	TG			**CG**		
Test	***M***	***SD***	***n***	***M***	***SD***	***n***
Pre-test	26.26	5.08	58	26.67	4.13	71
Post-test	6.14	2.31	58	5.31	2.38	71

M= mean, *SD*= standard deviation, *n*= number of responses

An ANCOVA was conducted to control for pre-existing differences in reading comprehension prior to the intervention. The results of the ANCOVA indicated that there was a significant difference in mean scores on the post-test between TG (M=6.14, SD=2.31) and CG (M=5.31, SD=2.38), $F(2, 129)=5.737$, $p= .018$. The effect size was small to moderate (partial eta squared= .044), with 4.4% of the variance in scores on the post-test accounted for by the treatment condition (participation versus non-participation in a post-reading CMSD activity).

With regard to Research Question 1, the results of the ANCOVA suggest that CMSD activities can assist learners with L2 reading text comprehension.

CMSD Logs

The CMSD logs were analysed for evidence of negotiation for meaning, following the 'trigger, indicator, response, reaction' pattern (Varonis & Gass, 1985) to inform the analysis. This is consistent with the approach adopted by Fernández-Garcia and Arebalaiz (2002), which was discussed in the literature review. In addition, following Murphy (2010), sociocultural

discourse analysis was employed to analyse the logs for evidence of exploratory talk (Mercer, 2004), in which "partners engage critically but constructively with each other's ideas" (p. 146). This is considered to be a characteristic of effective collaborative learning (Wegerif et al., 1998). Furthermore, the interactions were analysed for evidence of scaffolding being provided by a more knowledgeable peer to a less knowledgeable partner working within their ZPD (Gibbons, 2015).

In total, 36 CMSD discussions took place prior to the post-test, with 31 dyads and five triads. Four discussion logs showed no evidence of the participants attempting to complete the task, while eight others contained only limited evidence of exploratory talk or negotiation for meaning. However, the remaining 28 discussion logs did contain evidence of collaborative behaviour that was focused on the reading task. Verbatim extracts from some of these CMSD discussion logs are shown below, along with an analysis of the interactions they contain.

Negotiation for Meaning and Scaffolding

Extract 1 below contains a clear example of negotiation for meaning. Question 2 asks whether the statement "Very old people do not have to be vaccinated" is true or false, or whether no information is provided in the reading text. In order to answer the question correctly, the students needed to comprehend the following part of the reading text: "While certain students may be exempt because of age, medical reasons, or religious belief, they must submit documentation of exemption before registering."

In Turns 5 and 7 it appears that Student 2 is confused about the reason for the answer being "not given." In contrast, Student 1 displays his understanding of the reason in Turn 6, where he correctly argues that there is no mention of a specific age group in the text.

In Turn 7, Student 2 suggests that his answer was wrong due to the question being unclear. However, Student 1 clarifies that the question specifically mentions old people (Turn 8). Turn 8 is also the trigger, as Student 1 uses the word 'vaccinated.' In Turn 9, Student 2 indicates his lack of understanding of this word, which leads to Student 1 responding by supplying the Arabic translation in Turn 11. Student 2 then reacts by indicating his comprehension in Turn 12.

In addition to this being an example of successful negotiation for meaning, Student 1 exhibits collaborative behaviour that extends beyond the immediate task by sharing a strategy in Turn 16. Extract 1 also provides evidence that Student 1 used the elaborative feedback indirectly to help him support Student 2. For example, his advice in Turn 10 mirrors the guidance provided by the elaborative feedback contained within the reading exercise following a correct response to Question 1: "Correct. Paragraph 1 tells us 'certain students may be exempt because of age...' but it does not tell us what age groups are affected."

Extract 1. Negotiation for Meaning and Scaffolding

Turn	Time	Student	Comment
5	11:58 AM:	**Student 2**:	what about Q2
6	11:59 AM:	**Student 1**:	in Q2 mention old people but in the text they mention the age only...

7	12:00 PM:	**Student 2**:	yes and my answer was wrong because the question is not clear
8	12:01 PM:	**Student 1**:	i think you miss under stand the Q,,, it says the old people no need to be vaccinated?
9	12:02 PM:	**Student 2**:	what is vaccinated, i didnt understand this word
10	12:03 PM:	**Student 1**:	look at the text and you will find the sntence ((While certain students may be exempt because of age)) it dose not talk about the old people, it is only about the age ..
11	12:03 PM:	**Student 1**:	Vaccinated mean :::: تطعيم
12	12:04 PM:	**Student 2**:	aha now i understand
13	12:06 PM:	**Student 1**:	I think Q3 is not evident (clear) ??
14	12:08 PM:	**Student 2**:	yes i think that
15	12:09 PM:	**Student 2**:	i think the questions and the passges is diffcult to understand it
16	12:10 PM:	**Student 1**:	From this Q you can see how to use the key word to assist you for finding the answer and i think the key word is (before registering.)

Extract 1 showed an example of negotiation for meaning that followed the 'trigger, indicator, response, reaction' pattern. Other examples of negotiating the meaning of a lexical item occurred where the 'trigger' was an unknown vocabulary item in the reading text, rather than a word produced by one of the participants in a CMSD discussion. One example of this is shown in Extract 2 below.

Extract 2. Negotiation for Meaning and Scaffolding

Turn	Time	Student	Comment
9	8:38 AM:	**Student 3**:	ok .. so let us think about the questions
10	8:38 AM:	**Student 4**:	okey
11	8:39 AM:	**Student 3**:	the 1st one .. did u face any problem to solve it ?
12	8:39 AM:	**Student 4**:	yes
13	8:39 AM:	**Student 4**:	what does this word mean (immunisation)

14	8:40 AM:	**Student 3**:	i didnt sriuos problem
15	8:40 AM:	**Student 3**:	it means like protection i think
16	8:41 AM:	**Student 3**:	like when we take some pills to protect rm a disease ?
17	8:41 AM:	**Student 3**:	i think so
18	8:41 AM:	**Student 4**:	okey
19	8:41 AM:	**Student 4**:	thanks

Student 4 announces that she does not understand the word "immunisation" in Turn 13. However, the trigger for this comes from Student 3 in Turn 11, when she asks if her partner faced any difficulties in answering Question 1. Student 3 responds in Turns 15 to 16, in which she provides the meaning of the word, while also indicating her slight uncertainty in Turn 17 by typing "i think so." Student 4 then acknowledges her partner's response and thanks her in Turns 18 and 19.

Both Extracts 1 and 2 show examples of negotiating for meaning, where one student is able to help another by enhancing their comprehension of a word, question, or portion of the reading text. From a sociocultural perspective, both extracts illustrate the provision by a more knowledgeable peer of tailored assistance, in the form of scaffolding. Students 2 and 4 are both working within their ZPD and their reading comprehension is enhanced by the provision of scaffolding from their peers.

Exploratory Talk

Extract 3 below illustrates several characteristics of exploratory talk.

Extract 3. Exploratory Talk

Turn	Time	Student	Comment
11	2:36 PM:	**Student 6**:	Do you have any question abot the task ??
12	2:37 PM:	**Student 5**:	Q14 I dont understand why they chose the last answer
13	2:37 PM:	**Student 6**:	ok .. wait just a minute to check the question
14	2:37 PM:	**Student 5**:	I do think that the first answer is the most suituable answer for me
15	2:38 PM:	**Student 6**:	Submissions will be accepted no more than three days after the due date.
16	2:38 PM:	**Student 6**:	this the answers ,
17	2:38 PM:	**Student 5**:	ya I kown but

18	2:39 PM:	**Student 5**:	see that
19	2:39 PM:	**Student 5**:	Submissions will be accepted no more than three days after the due date. Ten per cent of the final grade will be deducted for each day the assignment is late
20	2:40 PM:	**Student 6**:	in this sentence she / he talks about what will happen if he / she sumbit the assigments after 3 days
21	2:40 PM:	**Student 6**:	when he / she late
22	2:40 PM:	**Student 5**:	oh
23	2:41 PM:	**Student 5**:	ok thanks
24	2:41 PM:	**Student 6**:	you are welcome any time
25	2:41 PM:	**Student 5**:	do you have any other question

In turns 11 and 25 of Extract 3, we can see that Students 5 and 6 are encouraging each other to participate. In Turn 12, Student 5 announces that she is unsure about the answer to Question 14. Student 6 first responds by offering to check in Turn 13, and then quotes the elaborative feedback provided for that question in the reading exercise. Student 5 initially accepts this in Turn 17 before challenging again in Turns 18 and 19. In this exchange, the two students are working collaboratively to create a shared understanding of the text. This ends with Student 6 providing further clarification in Turns 20 and 21, after which Student 5 acknowledges her help and thanks her in Turns 22 and 23.

Both students in Extract 3 are working collaboratively and respond well when their suggestions or explanations are challenged by their partner. This contributed to the success of the discussion. Equally interesting was that it appears that the elaborative feedback was used as a resource by Student 6 when helping Student 5. The same was apparent in Extract 1, where Student 1 used the elaborative feedback when assisting Student 2.

Off-topic Discussions

Extract 4 below shows an example of an off-topic discussion, with no evidence of negotiation for meaning or scaffolding. In turns 20 to 22, both Student 7 and Student 8 indicate that they felt the reading task was not very challenging. Furthermore, in turns 36 to 38, they imply that the reading exercise and the elaborative feedback within it provided sufficient support by supplying information about the correctness of a response, along with additional explanations. This suggests that, for this pair, the post-reading discussion was superfluous as an aid to reading text comprehension in this instance.

Extract 4. Off-topic Discussion

Turn	Time	Student	Comment
15	8:40 AM:	**STUDENT 7**:	okay- what question do you want to discuss??
16	8:40 AM:	**STUDENT 8**:	me i got some of them corret and some are incorrect
17	8:41 AM:	**STUDENT 8**:	ummmmm
18	8:41 AM:	**STUDENT 8**:	let me see
19	8:41 AM:	**STUDENT 7**:	okay
20	8:42 AM:	**STUDENT 7**:	i think the questions were straight forwed
21	8:42 AM:	**STUDENT 8**:	so im i
22	8:42 AM:	**STUDENT 8**:	it is not so difficult
23	8:43 AM:	**STUDENT 7**:	how much did you get out of 15?
24	8:43 AM:	**STUDENT 8**:	ummm, may be 10 out of 15
25	8:43 AM:	**STUDENT 8**:	hoe about you?
26	8:43 AM:	**STUDENT 8**:	how
27	8:44 AM:	**STUDENT 7**:	i got about 12 or 13
28	8:44 AM:	**STUDENT 7**:	i can't rememeber :P
29	8:44 AM:	**STUDENT 8**:	ecellent^.^
30	8:44 AM:	**STUDENT 8**:	excellent
31	8:44 AM:	**STUDENT 8**:	^.^
32	8:44 AM:	**STUDENT 7**:	well- next time we need to focus
33	8:44 AM:	**STUDENT 8**:	so ...?
34	8:44 AM:	**STUDENT 7**:	to get a full mark
35	8:45 AM:	**STUDENT 8**:	yes i agree with you
36	8:46 AM:	**STUDENT 7**:	well the test had everything- for example if you got any of the questions incorrect- it says it's incorrect with the explanation

37	8:47 AM:	**STUDENT 7**:	did you find the vocab deficult??
38	8:47 AM:	**STUDENT 8**:	yes , and it is easy 4 us to see where is our mistakes and solve it

Questionnaire Responses

The responses to the three Likert-scale items from the online questionnaire are summarized below in Table 2. Question Three, which focused on the CMSD activity, was only administered to the treatment group. The responses to Questions 1 and 2 indicate that the participants felt strongly that the reading practice exercise and the elaborative feedback had enhanced their understanding of the reading text. Furthermore, the responses to Question 3 suggest that the treatment group thought that the CMSD discussion had also enhanced their understanding of the text.

In order to test for between-group differences, independent samples t-tests were conducted to compare the mean scores of the treatment group's (TG) and control group's (CG) responses to Questions 1 and 2. No significant difference was found for Question 1 between the mean scores of TG and CG, $t(97)=.094$, $p=.925$ (two-tailed). The effect size (eta squared=.0009) was very small, with the grouping variable accounting for .009 per cent of the variance in scores on Question 1. Similarly, between-group differences in the mean scores on Question 2 were also insignificant, $t(97)=.801$, $p=.425$ (two-tailed). The effect size (eta squared=.007) was very small, with .7 per cent of the variance in scores on Question 2 accounted for by the grouping variable.

Table 2. Means, standard deviations and numbers of responses to the online questionnaire.

	Treatment Group			**Control Group**			**Groups Combined**		
	M	***SD***	***n***	***M***	***SD***	***n***	***M***	***SD***	***N***
Q1	4.00	1.00	47	4.02	1.04	52	4.01	1.02	99
Q2	4.60	.77	47	4.46	.90	52	4.53	.84	99
Q3	3.45	1.25	47	-	-	-	-	-	-

M= mean, *SD*= standard deviation, *n/N*= number of responses

Questions

Q1. The online practice exercise helped me prepare for the test.

Q2. The feedback (help) in the practice exercise helped me understand the reading text.

Q3. The online chat session helped me understand the text.

The responses to the open-ended questions, which asked the respondents to explain their answers to Questions 1 to 3 and to comment on their perceptions of the online reading comprehension exercise, the elaborative feedback contained within it, and the post-reading CMSD activity, were coded and re-coded several times to form categories, following Brown (2009). This process was followed by axial coding, during which related categories were subsumed under higher-level ones, as described by Dornyei (2007). Five categories emerged in relation to the elaborative feedback and reading comprehension exercise: text comprehension, task completion, reading skills, motivation and accessibility.

Learners' Perceptions of the Elaborative Feedback

Overall, the participants received the elaborative feedback very favourably. Example 1 below shows how one student felt that that the feedback had provided assistance with completing the reading task and had also enhanced text comprehension. However, as in example 2, others noted that, while the feedback had helped them to complete the task, it had not enhanced their comprehension of the text. Other participants felt that the feedback had supported the development of reading skills, as evidenced by the third example.

1. *"because it help me where is the right answer is .also help me to understand the article"*
2. *"not really! to be honest, it helped me to find the correct answer by clicking on all of the answers!!"*
3. *"it helps the student to identify the location of the answer and thus earning the student skill of the scaning & skiming"*

The positive impact of technology on motivation was mentioned by several participants, although not all were motivated to complete the task, as shown in example 4 below. The final category, accessibility, demonstrates the importance of the language contained within the feedback being at an appropriate level of difficulty, as seen in examples 5 and 6.

4. *"actually, it's a great idea but I didn't give it that effort"*
5. *"It is clearly and easy to understand"*
6. *The kind of words because they were very difficult and I did not understand most of them"*

Learners' Perceptions of the CMSD Activity

The responses related to the CMSD activity produced four categories: text comprehension, task completion, motivation, and collaboration. With regard to text comprehension, the opportunity to receive scaffolding from a peer was viewed as particularly useful, as seen in example 7 below. However, example 8 underlines the importance of the reading task being within the ZPD of the participants in order to enhance reading text comprehension through the generation of peer scaffolding.

7. *"my other firends help in understanding some phrases in the text that was not clear to me and this made me to understand the text much more"*

8. *"The online chatting help me but not very much because we both didn't understand some of the hard vocabs"*

The CMSD activity was considered a useful support for task completion, as it allowed participants to clarify the meaning of the comprehension questions, as seen below in example 9. However, as example 10 shows, this depended on the engagement levels of the students. In this regard, the motivation generated by the CMSD activity was mentioned by several participants, who considered it both enjoyable and useful, as evidenced by example 11. So too were the benefits of collaboration with peers, which are alluded to in example 12, as students worked together to resolve difficulties.

9. *"in my opinion it is very useful because it help us to understand the questions in another meaning"*
10. *"well we weren't chatting much about the test- only how was it and all"*
11. *"Having fun chatting with someone at the mean time having some information"*
12. *"it help to share our answer and find the best soulution"*

DISCUSSION

Computer-mediated Synchronous Discussion

With regard to Research Question 1, the quasi-experiment showed a small but significant positive effect for post-reading CMSD on L2 reading comprehension. Furthermore, qualitative analysis of the discussion logs provided evidence of negotiation for meaning and exploratory talk, which resulted in improved comprehension of parts of the reading text for some of the participants. These findings align with those of Fernández-Garcia and Arbelaiz (2002) and Murphy (2010). Likewise, the discussion logs provided evidence of more knowledgeable peers providing scaffolding to less knowledgeable partners, thereby enhancing their comprehension of parts of the reading text. This is clearly seen in Extracts 1 and 2 above. These findings are further supported by the results of the questionnaire, which suggested that the participants felt that the peer scaffolding generated by the discussions had enhanced their comprehension of the reading text, provided that the reading task was within their ZPD. In terms of the *Compensatory Model* (Bernhardt, 2011), peer scaffolding could be viewed as additional knowledge sources made available for compensatory processing when reading comprehension difficulties occurred.

However, the findings from the CMSD logs may also help explain why the effect size was small to moderate. Of the 36 discussions that took place, 12 contained little or no evidence of collaborative behaviour. In other words, one third of the discussions could have had little or no impact on the participants' comprehension of the text. One possible explanation for the lack of collaborative behaviour and engagement in 12 of the CMSD logs relates to task difficulty. Where the task was within the ZPD of one or more of the discussion partners, the conditions for learning may have been favourable (Gibbons, 2015), as seen in Extracts 1 to 3 above. In contrast, Extract 4 provides an example of an off-topic discussion containing no evidence of scaffolding to enhance the reading comprehension of either participant. In this example, it appears that both participants felt that they had received adequate scaffolding from the reading practice exercise

alone, obviating the need for a post-reading discussion. Had the text and/or the comprehension questions been more challenging, the post-reading CMSD activity might have been within the ZPD of one or both participants, potentially enhancing its usefulness as an aid to reading comprehension.

Elaborative Feedback

With respect to Research Question 2, the analysis of the chat logs showed that the elaborative feedback was used by participants during the CMSD sessions. Often it was used by a student to help provide support to a discussion partner. This is also consistent with the findings of Murphy (2010). However, in most instances where the feedback was used, it was cited verbatim by participants, rather than it being rephrased to provide additional support. Despite this, the discussion logs did provide evidence that elaborative feedback can promote both negotiation for meaning and exploratory talk in CMSD tasks and that it can provide scaffolding. However, as seen above, the developmental level of some of the participants may have meant that the elaborative feedback alone provided sufficient support for L2 reading comprehension, in the form of additional knowledge sources for compensatory processing, rendering the post-reading discussion unnecessary for these learners. In fact, the responses to Question 2 of the questionnaire demonstrate that the treatment group regarded the feedback as a very useful support to reading comprehension.

Learners' Perceptions

Unlike Fernández-Garcia and Arbelaiz (2002) and Murphy (2010), this study investigated learners' perceptions of the usefulness of elaborative feedback and CMSD. Overall, both the quantitative and qualitative results of the online questionnaire indicated that the learners considered the online reading exercise, the elaborative feedback within it, and the CMSD activity, to be useful supports for online reading comprehension.

Elaborative Feedback

The five categories that emerged from the qualitative analysis of responses related to the elaborative feedback, namely text comprehension, task completion, reading skills, motivation and accessibility, point to some of the possible strengths and limitations of this form of scaffolding. The learners' responses suggest that elaborative feedback may support online L2 reading comprehension and assist learners in completing reading tasks and developing L2 reading skills. However, its effectiveness may depend on the motivational levels of the learners to engage with the reading task. Likewise, it appears that the language used within elaborative feedback should be written at an appropriate level, so that it is accessible to the learners it is intended to assist. This aligns with the *Compensatory Model of Second Language Reading* (Bernhardt, 2011), which predicts that *other* factors, such as motivation and engagement, in addition to L2 language knowledge and L1 literacy, will determine L2 reading performance.

CMSD Activities

Qualitative analysis of the responses related to the CMSD activity also suggest that it may usefully assist L2 readers with online text comprehension and help them to complete online reading exercises. The opportunity to receive peer scaffolding from a CMSD discussion partner

was considered useful, as long as the reading task was at an appropriate level of difficulty. However, the motivational levels of the participants and their willingness to collaborate also appear to be important factors in determining the usefulness of this type of activity. These findings align with those of Li (2013), who noted that learner and task variables both affect the usefulness of CMSD tasks.

Sociocultural Theory and Scaffolding

Insights from sociocultural theory help explain findings from this study and from previous investigations into the use of elaborative feedback. As seen in the literature review, investigations into the most effective types of feedback for language learning have proven inconclusive (Brandl, 1995; Murphy, 2007, 2010; Nagata, 1993, 1996). When viewed through a sociocultural lens, it could be argued that elaborative feedback, as a form of scaffolding, needs to be carefully targeted at the individual needs of each learner working within his/her ZPD (Gibbons, 2015). The feedback therefore needs to be written with both the learner and the reading task in mind. Where a group of learners is largely homogenous with respect to L2 reading ability, the potential for elaborative feedback to support these learners in the comprehension of a reading text is raised. Where levels of L2 reading comprehension differ markedly within a group of learners, the ability of elaborative feedback to support the whole group is diminished.

The above interpretation also has implications for the use of post-reading CMSD as an aid to L2 reading. Unlike elaborative feedback, the use of which relies on the instructor or materials developer predicting the types of difficulty that a reading exercise will present, CMSD is dynamic in nature. More knowledgeable peers may provide tailored scaffolding by responding to the individual needs of their discussion partners as they arise. In some instances, no further support may be required. In others, the use of CMSD may usefully enhance the L2 reading comprehension of one of more of the participants and, if used in combination with elaborative feedback, may be used to help compensate for deficiencies in the latter by tailoring the scaffolding to the individual needs of the learners.

This current study was limited by its cross-sectional nature, which involved one post-reading CMSD activity. However, even in this study, the potential for CMSD discussions to enhance L2 reading comprehension was demonstrated. Future research could incorporate longitudinal studies of the use of CMSD and elaborative feedback to enhance L2 reading comprehension.

CONCLUSIONS

Overall, the findings from this study support the use of CMSD as an aid to online L2 reading comprehension. Given that CMSD activities require very little in terms of additional infrastructure or development time, with the majority of students in most parts of the world possessing a smartphone, tablet, or laptop computer, their use as a support to L2 readers away from the classroom can be recommended. With regard to elaborative feedback, while it does appear to be a useful support to both online L2 reading comprehension and to CMSD

discussions, language teaching practitioners and other educators should consider whether the time required to develop and produce elaborative feedback is worthwhile.

The use of both elaborative feedback and CMSD could potentially provide support to language learners in academic contexts and to students who use L2 reading texts as part of their regular academic studies across a variety of subject areas. As a learning and teaching tool, CMSD offers a convenient means of connecting learners who are studying in remote locations. It may be used to help compensate for the lack of face-to-face support that might be provided in a classroom situation. It has the advantage of requiring very little in terms of resources or materials development, given the availability of free synchronous communication tools designed for computers, tablets, and smartphones. In contrast, the use of elaborative feedback requires that an instructor or materials developer predict in advance the difficulties that target learners will experience when confronted with an L2 reading text. However, it too can provide useful scaffolding to enhance the L2 reading comprehension of learners.

Sociocultural theory provides instructors with a useful lens through which to view the support they provide to L2 readers. By aligning task difficulty, in terms of the L2 reading text and accompanying reading tasks, with the developmental level of the learners in terms of L2 reading comprehension, judgements about the usefulness of the support provided can be more usefully informed.

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